



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>4</sup> :</b>  <b>F16L 59/16, B29C 67/20</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 88/ 04388</b>  <b>(43) International Publication Date:</b> <b>16 June 1988 (16.06.88)</b>
<b>(21) International Application Number:</b> PCT/DK87/00096 <b>(22) International Filing Date:</b> 3 August 1987 (03.08.87) <b>(31) Priority Application Number:</b> 5793/86 <b>(32) Priority Date:</b> 2 December 1986 (02.12.86) <b>(33) Priority Country:</b> DK  <b>(71) Applicant (for all designated States except US):</b> TOPO CAP-UNIT A/S [DK/DK]; Enggade 6, DK-8700 Horsens (DK). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> JENSEN, Børge [DK/DK]; Gede højen 31, Hatting. DK-8700 Horsens (DK).  <b>(74) Agent:</b> HOFMAN-BANG & BOUTARD A/S; Adelgade 15, DK-1304 Copenhagen K (DK).		<b>(81) Designated States:</b> AT, AT (European patent), AU, BB, BE (European patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i> <i>In English translation (filed in Danish).</i>
<b>(54) Title:</b> METHOD OF MANUFACTURING A FORM STABLE HEAT INSULATING BOWL		
<b>(57) Abstract</b>  In a method for manufacturing a form stable heat insulating and diffusionproof bowl, a diffusionproof sheet (9) is first placed against a first part (6) of a mould, and then a second part (8) of the mould is so positioned in relation to the first part as to provide a cavity between the second part (8) and the sheet (9), following which curable plastics is foamed in said cavity.		

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Method of manufacturing a form stable heat  
insulating bowl

The invention concerns a method of manufacturing a form  
5 stable heat insulating bowl adapted to be mounted around  
a pipe installation to be insulated.

Insulating bowls are known e.g. from the DK Patent  
Application 150 392, which concerns bowls which, however,  
10 are not diffusionproof so that they cannot be used for  
insulating cooling installations. Further, in connection  
with heating installations, they are not suitable for  
insulating pipes which are subjected to temperatures in  
excess of about 120 °C.

15 Insulation of fittings in cooling circuits have till now  
been effected by placing an aluminium jacket around the  
fitting, and then curable plastics is foamed in the gap  
between the fitting and the aluminium jacket. This has  
20 the drawback that the insulation is to be destroyed  
completely if the fitting is to be serviced, following  
which the relatively time-consuming insulating process  
is to be repeated.

25 The object of the invention is to provide a method by  
which it is possible to manufacture partly diffusionproof  
insulating bowls and partly heat insulating bowls capable  
of withstanding very high temperatures, where these types  
of bowls can be mounted and disassembled repeatedly.

30 This object is achieved in that the insulating bowl is  
manufactured as stated in the characterizing portion of  
claim 1, which has the advantage in terms of manufacture  
that the pressure of the plastics mass during the foaming  
35 process urges the loosely pre-arranged layer of material  
into tight engagement with one of the mould parts. In

connection with cooling installations, the layer of material may typically be an aluminium sheet and may e.g. be a ceramic fibre material in connection with thermal insulation, and this layer of material is applied so  
5 loosely over the respective mould part that ample material will be present; it will be appreciated that the mould part adjoining the layer of material should not have any sharp edges.

10 When the plastics has cured, the outer surface of the bowl may be subsequently treated in various ways, depending upon the actual use. However, it is an advantage to make the outer surface of the bowl from an impact-resistant weatherproof material, and in this case it is  
15 particularly expedient to perform the method as stated in claim 5, wherein an impact-resistant and weatherproof shell of plastics is used as one of the mould parts.

The invention will be explained more fully by the following  
20 description of some embodiments with reference to the drawing, in which

fig. 1 schematically shows a pair of known insulation halves for a pipeline fitting,

25

figs. 2 and 3 show mould halves for manufacturing an insulating bowl according to the invention,

figs. 4 and 5 show examples of insulating bowls in a  
30 manufacturing phase according to the invention, in which various layers of various types of materials are used,

fig. 6 shows a section through an insulation around a cooling installation, using an insulation bowl manu-  
35 factured according to the invention.

Fig. 1 shows two identical insulating bowls 1 and 2 as known from the Danish patent specification previously mentioned. The bowls are moulded in polyurethane foam and shaped to fit around a pipeline fitting 3, it being possible to secure the bowls around the fitting by applying clamping bands in the shown grooves 4 and 5. These insulating bowls result in rationalization of the insulation of heating pipes.

10 However, e.g. in the petro-chemistry, there is an increasing need for insulation of cooling pipes where the well-known condensation and ice formation phenomenon occurs. To prevent formation of ice, the insulation around a cooling pipe must comprise a vapourproof membrane at the warm surface of the insulation, so that no water vapour can diffuse into the cold pipes where the vapour condenses and freezes. This form of insulation has till now been effected in the manner described in the beginning of the description.

20 With reference to figs. 2 and 3, a pair of embodiments of the method of the invention will be explained. The figures show a first mould half 6 and a second mould half 7 whose underside has a mould projection 8 adapted to be received in a trough-shaped depression in the mould half 6 so as to define a cavity between the two mould halves. Such mould halves can in principle be used for moulding insulating bowls of the type shown in fig. 1 by filling the cavity between the mould halves with polyurethane foam.

30 In a first embodiment of the invention, a vapourproof sheet 9 (e.g. an aluminium sheet) is placed in the first mould half 6, said sheet being shown transparent in fig. 3 for clarity. In fig. 3, the sheet is shown in a position where it has been pressed loosely down into the cavity of the mould half 6 manually or automatically,

so that the sheet 9 is creased somewhat and is far from being tightly engaged with the internal surface of the mould half. Then the mould halves 6 and 7 are assembled, and e.g. polyurethane foam is injected through the holes 10 shown in fig. 2. The special effect of the method of the invention is then that the pressure applied by the foaming material to the sheet causes the sheet to be urged into tight engagement with the internal surface of the mould so that the foaming process ensures that the sheet and thus the external surface of the insulating bowl have the desired shape. This method is typically used in connection with the making of insulating bowls for cooling installations.

For insulating bowls adapted for heating installations the structure of the bowls is slightly different, but the method is in principle the same as for the cooling jackets. Apart from the aluminium sheet being replaced, of course, by a decidedly heat insulating, thin layer of material (e.g. a ceramic fibre material), the method is changed in that, in contrast to the aluminium sheet, the layer of material is to be provided so that it defines the internal surface of the finished, heat insulating bowl. This just involves the difference that the layer of material is applied loosely on the second mould half 7 so that the foaming material is injected behind the ceramic fibre material so to speak.

Figs. 4 and 5 show a pair of insulating bowls 11 and 26 after removal from the mould halves. It will be seen in connection with fig. 4 that the sheet 9 has still not been cut along the rim of the insulation bowl. The external surface of the insulation bowl will therefore have a desired, well-defined contour, but although the sheet will be folded and have creases at several points, it will be unbroken so that the sheet is vapourproof.

As mentioned, the internal surface of the insulating bowl 11 consists of polyurethane foam and is quite smooth. In this embodiment, i.e. serving as a cooling jacket, it will particularly be desirable to subsequently treat the external surface of the insulating bowl, e.g. with a plastics cover which is impact-resistant and weatherproof. In a preferred embodiment of this method of the invention, a plastics shell is first provided, which is then used as a mould half 6, an adhesive being then applied between the plastics shell and the sheet 9. This provides an insulating shell which comprises on the outside an impact-resistant and weatherproof plastics shell, then a vapour-proof membrane and finally an insulating layer of polyurethane foam. Such an insulating bowl is likewise shown in section in fig. 6.

Fig. 5 shows the method adapted for manufacturing a heat insulating jacket 26, wherein the layer of material, now heat insulating, is to be positioned directly against the valve 14. This just means that the foaming polyurethane is to be sprayed to the other side of the layer of material, seen in relation to the production of the cooling jacket, so that the layer of material, which may be a ceramic fibre material as mentioned, will be shaped entirely according to the contour of the second mould half 7. In fig. 6, the broken line 28 indicates the position of the heat insulating layer of material in contrast to the vapour barrier sheet 21.

Fig. 6 also shows a pair of cooling pipes 12 and 13, between which a fitting 14 with a spindle 15 is placed. The pipes 12 and 13 are pre-provided with insulating webs 16 and 17, and also the spindle is provided with insulation 18. Then an insulating bowl manufactured by the method of the invention may be applied. The insulating bowl 19 comprises an outermost layer of impact-resistant

- and weatherproof plastics 20, and then, depending upon the purpose, a vapourproof membrane 21 and an innermost insulation layer 22, on the exterior of which a ceramic fibre material 28 may be arranged in replacement of the membrane 21. Apart from the shape shown in fig. 6, the bowl 19 may advantageously be given a rectangular contour, so that the assembled jacket is easy to clean, but can also advantageously be used for packaging the valve. For example a clamping band of a known type is used for the attachment, and when the insulating bowls are assembled, additional insulating webs 23, 24 and 25 are placed around the insulation previously described and tightly against the insulating bowl 19.
- 15 Very rational insulation of cooling as well as heating installations may be obtained in the manner described, the assembly being almost as simple as that known from the Danish patent and considerably more simple than the known insulating method. The prerequisite for the
- 20 assembly known per se with pre-manufactured insulating bowls is that it is possible to manufacture very inexpensive insulating bowls by the method of the invention which comprise either a vapour barrier or a heat insulating layer.



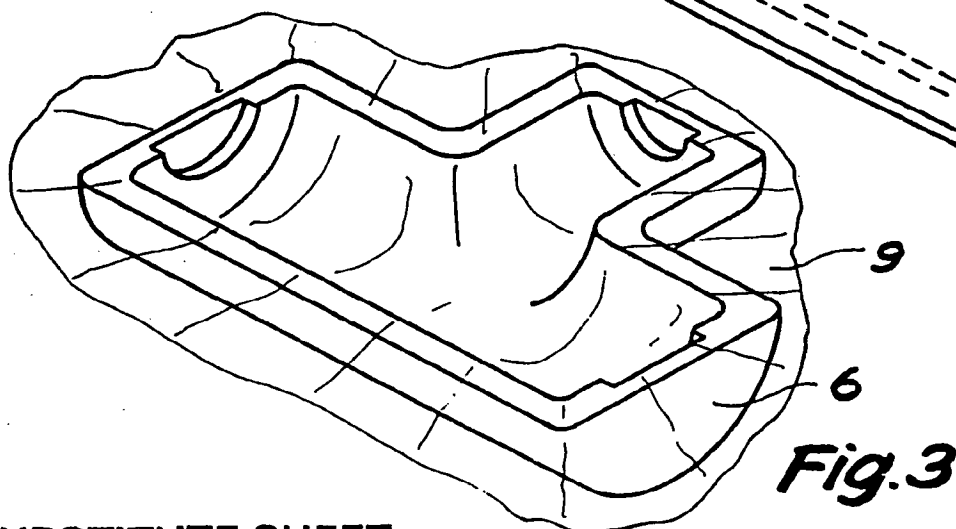
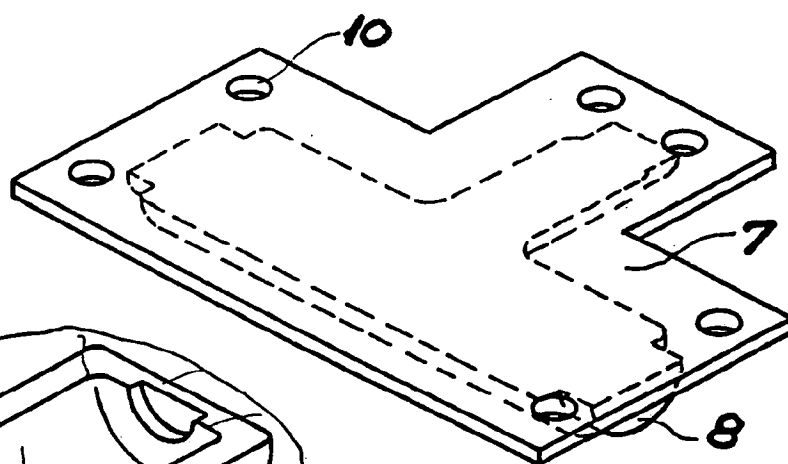
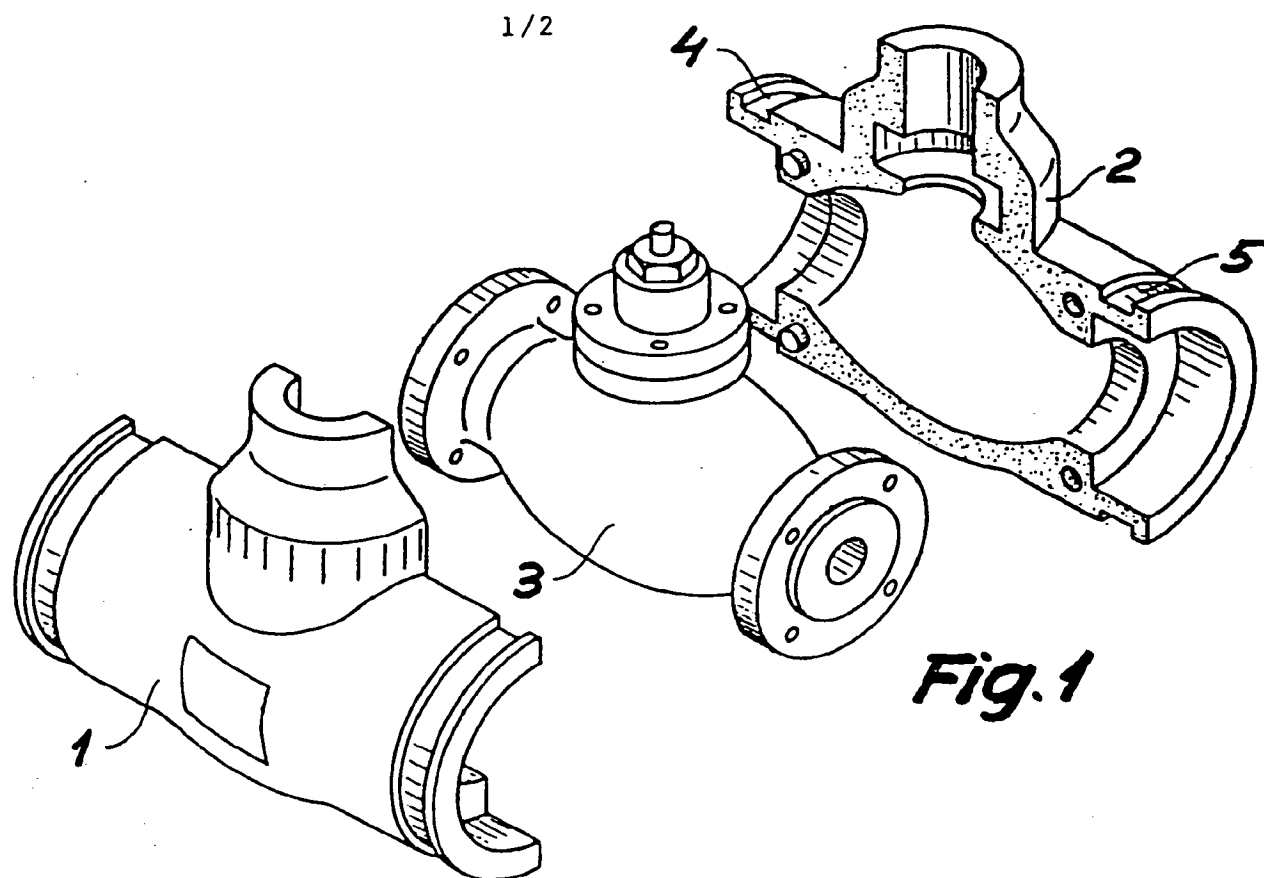
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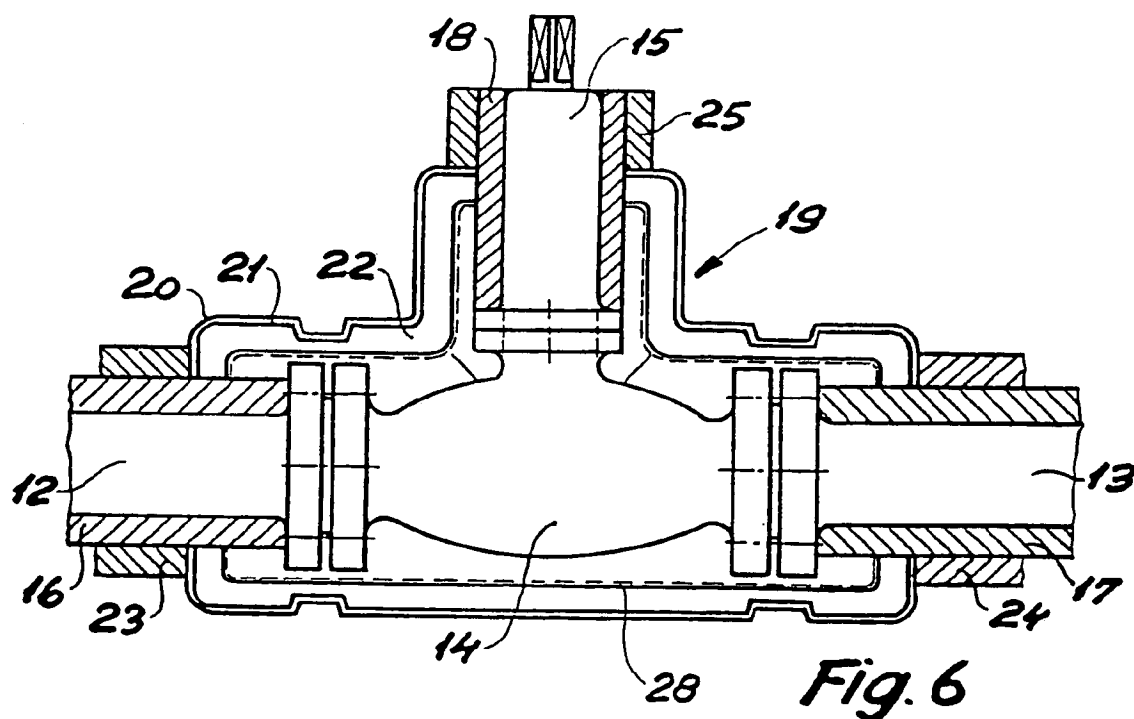
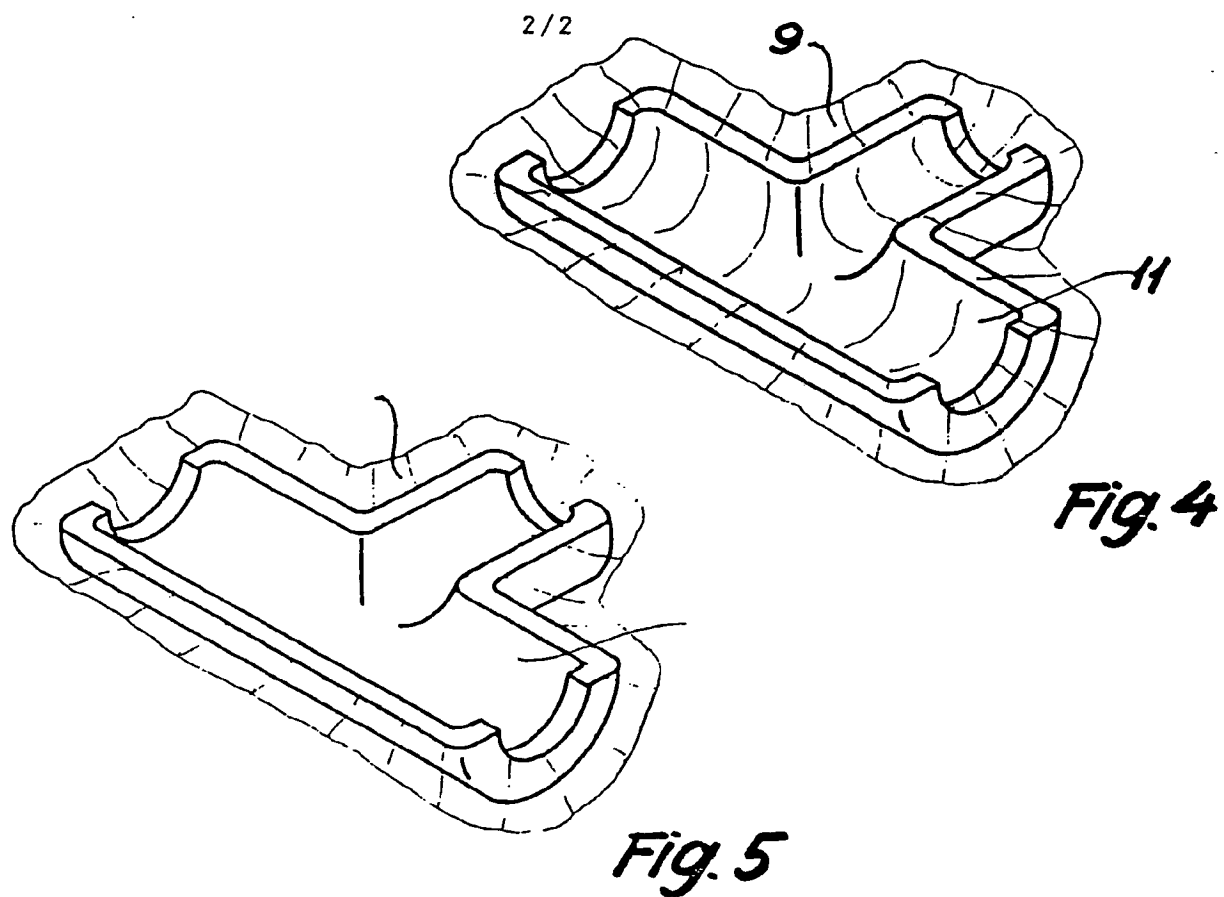
1. A method of manufacturing a form stable heat insulating bowl adapted to be mounted around a pipe installation to be insulated, characterized by providing a relatively thin layer of mouldable material against the inner side of a part of a mould so as to provide a substantially closed cavity between the layer of material and an opposite part of the mould,  
5 following which curable plastics is foamed in said cavity.
2. A method according to claim 1, characterized by using a vapourproof sheet as said layer of  
15 material.
3. A method according to claim 1, characterized by using a ceramic fibre material as said layer of material.  
20
4. A method according to claims 1-3, characterized by coating the outside of the cured bowl with a protective layer.
- 25 5. A method according to claims 1-3, characterized by using a pre-manufactured plastics shell as one part of the mould, and applying an adhesive to the inner side of said shell prior to said foaming operation.

## AMENDED CLAIMS

[received by the International Bureau  
on 18 April 1988 (18.04.88);  
original claims 1 and 5 combined as  
amended claim 1; claims 2 and 3 unchanged;  
claim 4 cancelled (1 page)]

1. A method of manufacturing a form stable heat in-  
sulating bowl adapted to be mounted around a pipe in-  
5 stallation to be insulated by providing a relatively  
thin layer of mouldable material against the inner side  
of a part of a mould so as to provide a substantially  
closed cavity between the layer of material and an  
opposite part of the mould, following which curable  
10 plastics is foamed in said cavity, c h a r a c -  
t e r i z e d by using a pre-manufactured plastics  
shell as one part of the mould, and applying an  
adhesive to the inner side of said shell prior to  
said foaming operation.
- 15
2. A method according to claim 1, c h a r a c t e r -  
i z e d by using a vapourproof sheet as said layer of  
material.
- 20
3. A method according to claim 1, c h a r a c t e r -  
i z e d by using a ceramic fibre material as said  
layer of material.





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**INTERNATIONAL SEARCH REPORT**

International Application No **PCT/DK87/00096**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>8</sup>	
According to International Patent Classification (IPC) or to both National Classification and IPC <b>4</b>	
<b>F 16 L 59/16, B 29 C 67/20</b>	
<b>II. FIELDS SEARCHED</b>	
Minimum Documentation Searched <sup>7</sup>	
Classification System	Classification Symbols
IPC 4	F 16 L 59/14, /16; B 29 C 67/20, /22
IPC 3	B 29 D 27/00
US C1	138: 149; 285: 47-54
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>	

SE, NO, DK, FI classes as above

<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
Y	SE, B, 433 396 (R SKARUD ET AL) 21 May 1984 & FR, 2361596 DE, 2736084 GB, 1538550 JP, 53021449 AT, 357296 SE, 7709003	1-5
Y	DK, C, 109 178 (T SÖRENSEN) 25 September 1967	1-5
Y	DK, B, 150 392 (B JENSEN) 4 September 1983	1-5
Y	FR, A, 1 556 658 (MANNESMANN AG) 7 February 1969 & NL; 6803311 GB, 1159329	1-5
Y	.../...	

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<b>IV. CERTIFICATION</b>	
Date of the Actual Completion of the International Search <b>1987-11-06</b>	Date of Mailing of this International Search Report <b>1987-11-27</b>
International Searching Authority <b>Swedish Patent Office</b>	Signature of Authorized Officer <i>Hans Christer Jönsson</i> <b>Hans Christer Jönsson</b>

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category*	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	GB, A, 1 585 470 (G COWEN ET AL) 4 March 1981 & BE, 860088 FR, 2369085 DE, 2747985 JP, 53084064 US, 4207278	1-5
A	SE, B, 440 268 (H-U VOIGT ET AL) 28 March 1981	1-5
A	NO, B, 147 124 (P H LARSEN ET AL) 25 August 1972	1-5
A	EP, A1, 108 856 (H N SELKER) 23 May 1984	1-5